

## OBSERVATIONS ON THE DISPOSITION OF OCULATA AND LATERAL OCELLI IN SELECTED APHIDOIDEA AND COCCOIDEA TAXA

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**ABSTRACT**—Various cephalic features of two aphid and two coccoid species were evaluated to determine similarities among the taxa. The position of the lateral ocelli is ventrad of the compound eyes in species of *Macrosiphum rosae* (Aphidinae) and *Callipappus australis* (Margarodinae). These ocelli are transposed dorsad in both *Mindarus abietinus* (Mindarinae) and *Drosicha stebbingii* (Monophlebinae). A shift from the ventral to the dorsal position may indicate an apomorphic state.

Since morphologists began looking for affinities within the sternorrhyncous lineage, a closer association of Aphidoidea and Coccoidea has consistently been advocated (Weber, 1928; Evans, 1963). Similarities in the cephalic features among species in these two superfamilies were earlier suggested by Quayyoom and Khan (1974). In their observations on representative species of the two taxa, various features of the oculata of Mindarinae/Aphidinae and Monophlebinae/Margarodinae were observed. The objective of this study was to compare selected cephalic characteristics, specifically those of oculata and the disposition of the lateral ocelli, for the male scale insects *Drosicha stebbingii* (Green) (Monophlebinae) and *Callipappus australis* (Maskell) (Margarodinae) and for the aphids *Macrosiphum rosae* (L.) (Aphidinae) and *Mindarus abietinus* Koch (Mindarinae) to determine potential affinities among the taxa.

### MATERIALS AND METHODS

The cephalic morphology of slide-mounted specimens representing each species was studied using a Leitz phase contrast microscope. Specimens were processed through a series of chemicals to remove the test and body contents before being stained and mounted on slides to examine the diagnostic features (Wilkey, 1962; Lambdin and Kosztarab, 1977). Observations on shape, position, and size were recorded and evaluated, and illustrations were prepared for each species.

### RESULTS

Similarities within the dorsocephalic region are visible among these different taxa (Fig. 1). *Drosicha stebbingii* (Fig. 1A) is regarded to be relatively less primitive than *C. australis* (Fig. 1B). The oculata of *D. stebbingii* are positioned mesad of but adjacent to the compound eyes, and they bulge inward basally. Each ocellus is medially located on the anterior inner angle of the oculatum. When viewed dorsally, the general shape of the head is triangular with the anterior apex projecting dorsad. Although *C. australis* (Fig. 1B) has retained a triangular head shape, it is considered more primitive than *D. stebbingii* based on those structures associated with the cranial apophysis and the possession of a shorter mid-cranial ridge. The lateral ocelli are located ventrad, each

placed slightly below the compound eye on a diminutive triangular oculatum. No other parts of the oculata are developed.

Within the aphid species *M. rosae* (Fig. 1C), the shape of the head is approximately triangular to quadrate, and the two compound eyes are located lateroventrally. The elongated, horizontally placed oculata terminate at the lateral ocelli and are positioned slightly ventrad to the eyes. The location of the lateral ocelli is comparable to that found in the margarodid, *C. australis*, although they are more laterally located.

*Mindarus abietinus* (Fig. 1D) is considered the more advanced of the two aphid species evaluated and possesses several specialized features on the head. The general structure of the head appears to be turned upside down. The triangulated tip, instead of being positioned near the venter of the head, is part of the labrum. The clypeal sclerite is rugose, and the mid-cranial ridge is looped anteriorly and bifid posteriorly. The lateral ocelli are located on pedunculi, as in some of the drosichid taxa, and are separated from and positioned anterad to the compound eyes (Quayyoom, 1980). A dark, cuboidal pad positioned between each ocellus and compound eye is distinctive.

### CONCLUSIONS

Dorsally, the heads of those Coccoidea males and Aphidoidea evaluated are normally triangular with the anterior apex of the triangle directed dorsad. Atypically, the apex of the triangle may be located near the labium (Fig. 1D). In those species representing relatively primitive coccoid and aphidoid taxa (Fig. 1B,C), the lateral eyes are located below the compound eyes in sharply defined oculata. In more advanced taxa, the lateral ocelli may shift to the dorsal aspect of an elaborate oculatum on the inner side of the compound eye (Fig. 1A) or separated from the compound eye on a pedunculated part of the oculata (Fig. 1D).

The position of the lateral ocelli is ventrad of the compound eyes in *M. rosae* (Aphidinae) and *C. australis* (Margarodinae). These ocelli are transposed dorsad both in *M. abietinus* (Mindarinae) as well as *D. stebbingii* (Monophlebinae). These species exemplify an ostensibly parallel evolutionary trend. In relatively more primitive taxa, the lateral ocelli are disposed ventrad to the compound eyes, whereas in comparatively advanced forms, they are transposed anteriad. Although the biological advantage of this shift is uncertain, it is apparent that a

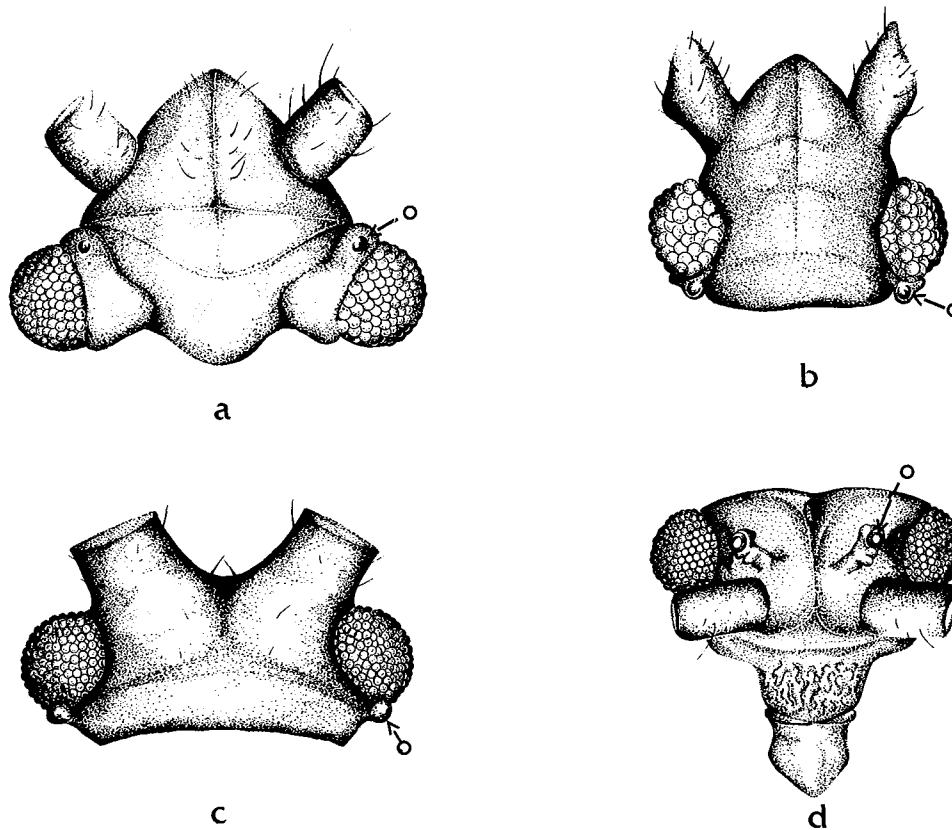


FIG. 1. Dorsal cephalic view of (A) *Drosicha stebbingii*, (B) *Callipappus australis*, (C) *Macrosiphum rosae*, and (D) *Mindarus abietinus*. Arrows are used to identify the ocellus (o) for each species.

transposition of the lateral ocelli from a ventral to a dorsal position exists.

#### ACKNOWLEDGMENTS

We are grateful to H. Denmark, Florida Department of Agriculture and Consumer Service, Gainesville, Florida, for providing the aphid specimens used in this study and to Renée Chagnon for her assistance in preparation of the illustration.

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